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10 CFR 50.73

RA19-001

January 15, 2019

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

LaSalle County Station, Unit 2
Renewed Facility Operating License No. NPF-18
NRC Docket No. 50-374

Subject: Licensee Event Report 2018-001-01, Manual Reactor Scram due to Main Condenser Vacuum Degradation

In accordance with 10 CFR 50.73(a)(2)(iv)(A), Exelon Generation Company, LLC (EGC) is submitting Licensee Event Report (LER) Number 2018-001-01 for LaSalle County Station, Unit 2.

There are no regulatory commitments in this letter. Should you have any questions concerning this report, please contact Ms. Dwi Murray, Regulatory Assurance Manager, at (815) 415-2800.

Respectfully,

John Washko
Plant Manager
LaSalle County Station

Enclosure: Licensee Event Report

cc: Regional Administrator – NRC Region III
NRC Senior Resident Inspector – LaSalle County Station

NRC FORM 366 (04-2018) | U.S. NUCLEAR REGULATORY COMMISSION | APPROVED BY OMB: NO. 3150-0104 EXPIRES: 03/31/2020

LICENSEE EVENT REPORT (LER)

(See Page 2 for required number of digits/characters for each block)

(See NUREG-1022, R.3 for instruction and guidance for completing this form http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/)

1. Facility Name	2. Docket Number	3. Page
LaSalle County Station, Unit 2	05000374	1 OF 3

4. Title

Manual Reactor Scram due to Main Condenser Vacuum Degradation

5. Event Date			6. LER Number			7. Report Date			8. Other Facilities Involved	
Month	Day	Year	Year	Sequential Number	Rev No.	Month	Day	Year	Facility Name	Docket Number
08	31	18	2018	001	01	01	15	19	NA	NA
									Facility Name: NA	Docket Number: NA

9. Operating Mode	11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: *(Check all that apply)*			
1	☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
	☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
	☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
	☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☒ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
10. Power Level	☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
29	☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
	☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(C)	☐ 73.77(a)(1)
	☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(D)	☐ 73.77(a)(2)(i)
	☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(vii)	☐ 73.77(a)(2)(ii)
		☐ 50.73(a)(2)(i)(C)	☐ Other (Specify in Abstract below or in NRC Form 366A)	

12. Licensee Contact for this LER

Licensee Contact	Telephone Number (Include Area Code)
John Van Fleet, Operations Director	(815) 415-2200

13. Complete One Line for each Component Failure Described in this Report

Cause	System	Component	Manufacturer	Reportable to ICES	Cause	System	Component	Manufacturer	Reportable to ICES
B	WK	Pipe	NA	Yes	NA	NA	NA	NA	NA

14. Supplemental Report Expected	15. Expected Submission Date	Month	Day	Year
☐ Yes (If yes, complete 15. Expected Submission Date) ☒ No		NA	NA	NA

Abstract (Limit to 1400 spaces, i.e., approximately 14 single-spaced typewritten lines)

On August 31, 2018, while operating at approximately 29 percent power, a reactor manual scram signal was inserted on Unit 2 due to main condenser vacuum degrading. The turbine was tripped following the scram. During the scram, one control rod did not fully insert but was manually fully inserted. The plant was in a stable condition, with reactor pressure being maintained by the turbine bypass valves, and reactor water level was controlled using feedwater. Except for the single control rod insertion, required safety systems and shutdown equipment performed as expected, and there was no impact to Unit 1. This condition was reported on August 31, 2018 (ENS 53576) in accordance with 10 CFR 50.72(b)(2)(iv)(B) for a reactor protection system (RPS) actuation. This condition is reportable in accordance with 10 CFR 50.73(a)(2)(iv)(A) as a condition that resulted in a valid actuation of the RPS.

The condition was attributed to localized impingement degradation of a turbine building miscellaneous equipment drain header resulting in through-wall failure. Corrective actions were taken to install a robust welded temporary patch on the drain header, with a header replacement scheduled for the upcoming Unit 2 refueling outage L2R17 (2019), and revise procedures to incorporate lessons learned.

A root cause investigation identified additional corrective actions necessary to address weaknesses in the original design of the header susceptibility to localized impingement (on both units), revisions to training materials and procedures, and training and communications to engineering staff regarding piping failure mechanisms.

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
LaSalle County Station, Unit 2	05000374	2018	- 001	- 01

NARRATIVE

PLANT AND SYSTEM IDENTIFICATION

LaSalle County Station Unit 2 is a General Electric Boiling Water Reactor with 3546 Megawatts Thermal Rated Core Power.

The affected system was the main condenser and turbine building equipment drains (TE) system. Specifically affected was the miscellaneous drain header (2TEC5A) from the A and B turbine-driven reactor feed pump (TDRFP) steam supply drain lines.

CONDITION PRIOR TO EVENT

Unit(s): 2	Date:	August 31, 2018	Time:	2105 CDT
Reactor Mode(s): 1	Mode(s) Name:	Power Operation	Power Level:	29 percent

DESCRIPTION

On August 31, 2018, at approximately 29 percent power and during a controlled unit shutdown to support a planned maintenance outage L2M20, a reactor manual scram signal was inserted due to main condenser vacuum degrading. The turbine was tripped following the scram. Main condenser vacuum was at approximately six inches mercury (Hg) of back-pressure and slowly improving following the scram and turbine trip. During the scram, one control rod (30-31) did not fully insert. This control rod was manually inserted to notch position 00 (fully inserted), with the first position identified as notch position 24 of 48 (fully withdrawn). The plant was in a stable condition, with reactor pressure being maintained by the turbine bypass valves, and reactor water level was controlled using feedwater.

Four weeks prior to the event, on August 3, 2018, Unit 2 off-gas flow suddenly increased to an abnormal level. A leak (approximately 3-inch diameter hole) was identified on a miscellaneous drain header 2TEC5A, in the heater bay. A temporary repair consisting of an 8-inch pipe that was cut in half to form a patch for the bottom of the header was installed. The fabricated patch included a clamping mechanism and a vent valve to divert the steam during its installation. The patch brought off-gas flow back down to normal.

As steam inputs into the header were removed during the unit shut down four weeks later, the dynamics at the patch changed which allowed air in-leakage to increase. When water was added via the TDRFP gland steam loop seal, air in-leakage was again significantly reduced at the patch. However, as more inputs changed to a vacuum, there was increased air in-leakage. This, combined with other air in-leakage sources, such as the steam packing exhauster (SPE) loop seal not being full, eventually led to the degradation of main condenser vacuum requiring an unplanned manual scram.

CAUSE

The causal investigation determined the root cause was the original design of the miscellaneous drain header 2TEC5A is susceptible to localized impingement degradation, which resulted in through-wall failure. The 2TEC5A header has inputs from two, one-inch orifices that provide continuous superheated steam into the 2TEC5A header from the 2A and 2B TDRFP low-pressure steam supply drain lines. One of the inputs discharges directly over the hole that developed in the bottom of the 2TEC5A header, and the other is within a few inches. These inputs create high velocity localized impingement that structurally weakened the header to the point of failure.

Contributing causes included weaknesses with the vendor following purchase order requirements, SPE loop seals that have been a historical source of air in-leakage to the condenser, ineffective communication between site Engineering and the affected organizations during L2R16 which resulted in inaccurate recommendations, and inadequate technical review of the temporary leak repair evaluation that did not anticipate or account for changing conditions in the header during the Unit 2 shutdown process.

A separate causal investigation evaluated the control rod 30-31 failure to fully insert during the manual reactor scram. The cause was determined to be a lack of explicit guidance and test data available for decision-making based on the aggregate impact of insert stall flows above 5.0 gpm and channel distortion on scram times.

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
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LaSalle County Station, Unit 2	05000374	2018	- 001	- 01

NARRATIVE

REPORTABILITY AND SAFETY ANALYSIS

The event was reported on August 31, 2018 (ENS 53576) in accordance with 10 CFR 50.72(b)(2)(iv)(B) for an RPS actuation. This event is reportable in accordance with 10 CFR 50.73(a)(2)(iv)(A) as a condition that resulted in a valid actuation of the RPS.

While operating at approximately 29 percent power, a reactor manual scram signal was inserted on Unit 2 due to main condenser vacuum degrading. The turbine was tripped following the scram. During the scram, one control rod did not fully insert but was manually fully inserted. The plant was in a stable condition, with reactor pressure being maintained by the turbine bypass valves, and reactor water level was controlled using feedwater. Except for the single control rod insertion, required safety systems and shutdown equipment performed as expected, and there was no impact to Unit 1.

CORRECTIVE ACTIONS

Immediate corrective actions taken in response to the condition were:

- Operations personnel performed the required plant shutdown.
- A more robust welded temporary patch was installed on the drain header with a complete header replacement scheduled in the upcoming Unit 2 Refuel Outage L2R17.
- Procedure revisions were implemented as an interim action, to minimize the risk of a similar issue with the SPE loop seal during the start-up from L2M20.

Additional corrective actions identified from the root cause investigation are:

- Install a design change to eliminate the Unit 1 and Unit 2 main steam 1(2)MS08MA/B restriction orifices and install blanks in place as the corrective action to prevent recurrence.
- Replace the 2TEC5A header during the next Unit 2 refueling outage L2R17.
- Perform component failure analysis of the 2TEC5A header and evaluate for potential additional actions.
- Enhance work instructions and procedures related to temporary leak repairs and significant challenges to maintaining off-gas air in-leakage or main condenser vacuum.
- Perform training gap analysis, with specific actions to address the technical aspects of the event and reinforce the appropriate behaviors, and to enhance training for mechanical engineers regarding piping failure mechanisms.

PREVIOUS OCCURRENCES

Searches were performed of the LaSalle Corrective Action Program (CAP) database, operating experience records, and licensee event reports for the previous three years. No similar previous events for LaSalle Station was identified for the system or failure mode. However, one event was found that involved a pipe vent valve leakage as listed below.

LER 374-2015-003-00

On August 7, 2015, LaSalle Unit 2 was in Mode 3 for a planned maintenance outage. During the initial drywell entry, a steam leak was observed on the reactor recirculation (RR) system line 2RR94AB-3/4", which is upstream of valve 2B33-F080B (RR Pump Discharge Valve 2B33-F067B Inspection Port - Reactor Side Upstream Stop Valve). The leak was determined to be pressure boundary leakage. Technical Specification 3.4.5, "RCS Operational Leakage," Required Actions C.1 and C.2 were entered, which required the unit to be in Mode 3 within 12 hours and in Mode 4 in 36 hours, respectively. The cause of the steam leak was determined to be poor weld quality and vibration induced fatigue. The weld was repaired during the maintenance outage.

COMPONENT FAILIRE DATA

Manufacturer: NA
Device: Turbine Drain Collecting Water Piping
Component ID: 2TEC5A, Header, Piping, 8 Inch, for Turbine Drain Collection Water Piping (Cat ID 0001400796-4)